

General – Refueling and electrical charging

It is not compulsory to refuel cars, but fuel consumption can be detected by means of cars' own consumption indicators or other methods. The procedure is written in the contest invitation.

To obtain Plug-In-Cars' (PHEV and BEV) results smoothly, electrical recharging should be avoided. Competitors can charge their cars before the competition.

On breaks, cars can be recharged, and recharged energy may be ignored if cars have their own consumption meters or other methods for determining energy consumption.

On the other hand, if the result is produced by comparing the charge levels of the batteries at start, break and finish, all recharging made during the competition will be taken in result. In this case, the batteries are not intended to fully charge, but the charged energy is proportional to changes in battery charge level.

The Call for Competition (invitation) explains the consumption definitions for each class. The energy used can be determined according to the energy that has been refueled and externally loaded. But it can, as well, be determined that electricity consumption is calculated based on battery capacity. Also the use of car's own meters and on-board-computers can also be used if it has been said in the competition invitation.

The car must be able to cope with additional fuel or additional energy during break(s), if the organizers have created a chance.

Conversion co-efficient for different forms of energy:

	Unit	Energy content (kWh)	CO ₂ factor is not used in 2019	NB!
B (95 and 98)	l	8,684	23,5	
E85	l	6,389	?	Ethanol from waste max 85%, practically less
D	l	9,937	26,6	CO ₂ value of Neste Oil MyDiesel?
CNG	Kg	11,194	27,14	Biogas CO ₂ 0?
Electric energy	kWh	1	?	CO ₂ : Renewable – on average – marginal extra energy prod.?

Diesel (D) and Petrol Class (B) filling procedure:

Fuel shake-down is part of refueling procedure.

The Class result is calculated as a mass fixed result. The modified result will be got by calculating two separate result factors: A 70% of straight or real consumption per 100 km and a 30% of consumption per 100 km per ton (1000 kg). The vehicles kerb weight is



used and the figure is got from registration attest. Calculation
 $= (\text{Consumption} * 0,7) + (\text{Consumption} / \text{kerb weight}) * 1000 * 0,3$

Refueling before the start

Drive from the competition office (or other departure point) to the petrol station. This part of route is not part of the competition. Refueling is a two-step procedure. Fillings may take place on two different patrol stations and may be differing stations at the final fillings. The Competitor will pay for all his/her refueling, unless otherwise stated in the invitation.

When entering to the fillings, the tank must take at least 10 liters of fuel (filling 1 + 2 summed up). If it will be less, percentage punishment calculated for the total consumption will follow (see EcoRun Regulations section 25).

The place for fillings must be flat. The tilt angle may be $-3^\circ \dots +3^\circ$ when filling is made without lifting one wheel. When the vehicle's wheel closest to filling cap is raised, the tilt may be $+7^\circ \dots +13^\circ$. The car must be at the same place for all refueling. The distance may differ in maximum 5 centimeters. When drive through ramps are used, the ramp place must be marked on the ground.

All refueling is done by the representative(s) of the organizer. During refueling, no one is allowed to be in the car. The wobbling of the car is forbidden.

Refueling 1:

- Always 7 minutes per car. The first press of the pistol begins time calculation,
- Organizer's representative(s) fill the car on the ground (not lifted). Fuel quantities, and any removal of fuel shall be entered with two decimal places. Also the measured tilt angle, refueling time, name of the filler, and the filling place will be entered in both the refueling card.
- The Competitor will pay for all his/her refueling, and the shake down will be driven according to the road book. This is not part of the competition route.

Refueling 2:

- Always 5 minutes per car.
- Organizers refuel the car lifted so, that real tilting will be $7-13^\circ$ angle.
- At the end of the refueling some fuel (0,3 to 1 liter) may be removed from the tank to prevent the overflow.
- All the markings are done in the same way as in refueling 1.
- After the approved refueling, the fuel filler hole can be sealed.

After refueling (possible removal and payment made) the competitor pair moves to the time control (TC) station, from which competitors will start to the route two minutes intervals.

Refilling at finish

The competition ends in a two-step final refueling. Refueling may be in different petrol stations and they do not have to be the same than at the start.

Refueling 3: (Always 5 minutes per car) Organizer(s) refueling the car on a flat ground, after which you will be driven shake down according to the road book. Shake down is now part of the competition. Each competitor pays for the fuel, unless otherwise stated in the invitation.

Refueling 4: (Always 5 minutes per car) Organizer(s) refueling always tilted to 7-13° angle.

The contest ends with an approved phase 4 refueling. The decision is made by the filling marshal. After refiling competitors drive to the Finish, according to instructions by the organizer.

The fuel used in the contest is the step 3 and 4 refiling summed up minus the possible removal of fuel at step 2. Used fuel (+ any penalties) is the result criterion with the mass compensation (mass fixed result).

Hybrid class (HEV) refiling procedure:

The filling instruction is the same as for classes B and D, but the class result is calculated without mass compensation. The one consumed the least, is the class winner.

Plug-in-hybrid Class (PHEV) refiling and recharging:

The filling instruction is the same as for classes B / D / HEV, but the class result is calculated without mass compensation. In addition, there are recharging instructions:

The batteries are assumed to be full before the competition and empty at the end. Battery recharging must be performed before first refuelling. in the AL-Sport EcoRun Cup -contests PHEVs are recharged in the middle of the competition at halts, or at finish, unless otherwise stated in the invitation.

The PHEV class results both electricity and fuel (petrol or diesel). The combined energy is reported in kWh.

The electric energy is calculated according to the nominal capacity of the batteries.

in the Cup contests the PHEV class route should be the same or almost the same as in B, D and HEV Classes. If the route is 80 – 120% the same, the results are taken in official cup results.

Battery electric vehicles (BEV) recharging procedures:

The competitors will recharge the cars on their own before the competition. The point of start and finish of BEVs may differ from the other classes. It is recommended that BEVs start the route before other competitors – especially if you are loading cars at halt points. The route can be arranged to go through the main starting point, so that all classes are driving mainly the same route.

The recommendation number one is that no cars will be recharged in the finish. Recharging of the vehicles on the halt makes the electric vehicle competition longer than in other classes, in spite of up to 20% shorter route. If The cars are not recharged in the finish, the BEV class can arrive one hour later and their energy consumption will be obtained in the result calculation at the same time as the other classes. The Procedure may be e.g. following:

- The Vehicle's own instrument panel indicates the energy used on the route. In most of the cars, energy is reported as the total energy consumption kWh / 100 km.
- Presumably in all the BEVs the recharging during the contest does not reset the consumption per 100 kms readings.
- Some cars, such as the Nissan Leaf, a mobile application is available to provide more and more detailed information on consumption.

If cars are loaded during the contest, then the idea is to get the energy consumption with one or two short recharges. The procedure can be like:

- The battery charge level is detected before departure
 - Charge level as a %-figure
 - Charge level as remaining range (in kms)
 - Charge level as remaining energy (in Kwh)
- At halt it is mandatory to recharge. Before recharging it is important to read charge level according to the previous point as well as after the recharge.
- At finish charge levels are read once again according to the previous point. The energy used by the instruments will be added into the amount of energy recharged during the halt (break).

Electric cars do not drive shake-down.

In the Cup competitions the BEV Class route should be 80 – 120 % of the B / D / HEV class route. If the route length is 80 – 120% the same, the results are taken in official cup results.

Natural Gas Class (CNG) refiling procedure:

Gas cars come to the competition scene with full fuel (petrol) tank. These cars are filled with petrol only once before the route. Refuelling of less than 10 liters is not punished because in gas cars the gasoline tank is often very small.

Normally, only on the day of contest it will be clear what kind of gas cars are in competition, unless CNG class cars are restricted in the invitation.

Competition with cars that use on the route both petrol and gas:

Now in CNG results are both gas and gasoline energy calculated. Both of the energy sources are refueled at finish, too. There is no shake-down, either gas or petrol, at the start fillings.



The cars are refueled by gasoline at the end of the competition, with two-step refueling. Gas refill is only one-step procedure.

Competition with cars that only gas use the route:

If competing cars in the CNG class use exclusively gas on the route (such as e.g. VAG cars and at least some of the Mercedes-Benz gas models), then gasoline will not be counted, and there will be no gasoline refueling at the end. In this case, only gas consumption is included in the competition results. As of fairness, car gasoline tanks must be full when the competition begins.

If in the event there are only VAG gas cars, the cars must be run idle (stationary) for so long that the indicator light on the instrument panel indicates that the car is using exclusively gas.

If the route length is 80 – 120% of the B / D / HEV classes, CNG class will be accepted in the official competition results.

One source of information on gas car models is Gasum website:

<https://www.gasum.com/yksityisille/valitse-kaasuauto/kaasuautomallit/>

Ethanol Class (E85, flexifuel) refuelling procedure:

With a few exceptions, refueling procedure is the same as for B / D / HEV classes:

At the start the minimum refueling amount is the nominal volume of the tank minus 10 liters. The first refueling time is 7 minutes. If the refueled amount is too low, the competitor will be penalized by a percentage increase (see section 25 of the rules, Error percentages) calculated for total consumption. **If the refueled amount is half or less than half of the tank nominal volume, the competitor is excluded from the competition.**

In the Cup competitions, a E85 class route should be the same or almost the same as B / D / HEV Classes. If the route length is 80 – 120% of B / D / HEV classes, so results be accepted in the official competition results.

Fuel cell Electric Vehicle (FCEV) Class refueling procedure:

The Car will be refueled at the hydrogen refueling station before the contest and at the end of the contest without any shake-down. Consumption is calculated for the trip between refueling.

In the Cup competitions should FCEV Class route length be 80 – 120 % of B / D / HEV classes, so results be accepted in the official competition results.